

REMARKS

Added claims 21 to 58 are fully supported by the Specification, Claims as originally filed, and Drawings. For example, the original claims, drawings and at least the following lines support the added claims:

(1) Page 8, lines 15-16:

"...a flow control device can be used to flow influent solution into the inlet 30 of the housing 25."

(2) Page 15, lines 23-25:

"In one version, the variable voltage supply 50 provides a time modulated or pulsed direct current (DC) voltage having a single polarity that remains either positive or negative, during an ion removal step, or during an ion rejection step."

(3) Page 16, lines 3-7:

"The voltage supply 50 can also includes a polarity switch 44 to switch polarity to the electrodes 40, 45, for example, to either momentarily add ions to solution to maintain a desired concentration in the solution in the cell 22 during the ion removal step, or to regenerate the membrane 100 in the cell 22 to prepare for a subsequent ion deionization step."

(4) Page 22, lines 20-122:

"Subsequently, in a deionization or ion removal step, the influent solution flow direction and polarities of the time averaged voltage applied to the electrodes 40, 45 of the cell 22 were reversed."

(5) Page 14, line 22 to page 15, line 21:

"The apparatus 20 further comprises a variable voltage supply 50 to maintain the first and second electrodes 40, 45 at a plurality of voltage levels during an ion exchange stage. The voltage bias levels are selectable voltage levels that have different magnitudes during the ion exchange stage. For example, the voltage levels can be time averaged voltage levels that are each a fixed constant voltage level or fixed pulsed voltage level, during a pre-specified time period that is a portion of the time period of an ion exchange stage, such as (i) a solution treatment step, for example, a deionization or ion removal step in which ions are removed from the influent solution 70 to form the effluent solution 80, or (ii) a membrane regeneration step or ion rejection step in which the membrane 100 is regenerated by expelling or replacing ions in the membrane, (ii) but not both. The ion removal step is a pass of the influent solution across the anion and cation surface 46, 48 of the water-splitting membrane 100 in the electrochemical cell 22 to change the ion concentration level in the influent solution 70 by removing or replacing ions from the influent solution 70. The ion rejection step is a regeneration cycle in which the water-splitting membrane 100 is regenerated by expelling or rejecting ions in the membrane 100. In each step, the time averaged voltage level is determined by averaging the magnitude of the voltage applied to the electrodes 40, 45 over a selected time period. The time period is a length of time in which the voltage has a peak absolute magnitude that remains substantially the same.

Figure 4 shows an exemplary embodiment of variable time averaged voltage levels for an ion removal step (graph (a)) and an ion rejection step (graph (b)). In this figure, the magnitude of the pulsed voltage is plotted over time to show different time cycles in each of which, the time-averaged voltage is maintained at one level. Graph (a) demonstrates a variable time averaged voltage applied to the electrode that has a first magnitude (V_1) that remains substantially the same over a first time period (T_1), a second first magnitude (V_2) that remains substantially the same over

a second time period (T_2), a third magnitude (V_1) that remains substantially the same over a third time period (T_3), etc. Curve (b) shows a time averaged voltage having a reversed polarity with negative values of voltages (V_4) (V_5) (V_6) that are used during different time periods (T_4) (T_5) (T_6) of an ion rejection step. In each step, the time average voltage generates a time averaged electric field in the cell of different field strengths. The varying electric field has a field strength proportional to the different applied voltage levels. It should be noted that in the ion rejection step, the voltage can also remain substantially constant over the entire cycle, since the objective is only to expel ions from the membrane 100."

Thus, no new matter is being added, and entry of the amendments is respectfully requested.


Should the Examiner have any questions regarding the above amendments or remarks, the Examiner is requested to telephone Applicant's representative at the number listed below.

Respectfully submitted,

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